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Innsbruck Physics Colloquium

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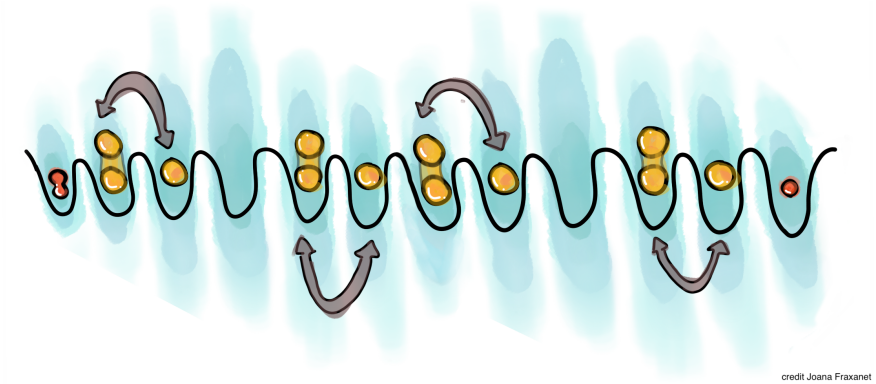
Exploring quantum matter with ultracold dipolar systems

Over the last decades, quantum simulators made of atoms at ultralow temperature established themself as a fundamental tool to explore and understand novel properties of quantum matter. While systems where the elementary constituents interact locally have been widely studied, configurations where particles are subject to highly non-local couplings remain less investigated. In this direction, ultracold systems characterized by long-range dipolar interaction offer unique perspectives. In this seminar I will review the different setups where significant dipolar interactions can be achieved and the intriguing states of matter that have been realized. I will then describe configurations where dipolar particles are forced to move in discrete geometries, the so called optical lattices, which allow reproducing physical scenarios closely related to the ones encountered in real materials. In such a context, I will show how dipolar repulsion can become the main responsible for appearance of different phases with broken discrete symmetries connected through purely quantum phase transition not predicted by the standard Landau-Ginzburg-Wilson theory. Finally, I will further discuss different examples where the competition between local and dipolar interactions can give rise to exotic states of matter, the symmetry protected topological phases



credit Joana Fraxanet

Tuesday, 24.10.2023, at 16:45 h, HS C (Technik)

Innsbruck Physics Colloquium,
Organisation: K. Erath-Dulitz, H.-C. Nägerl, T. Schrabback